



Highly sensitive and label-free detection of biotin using a liquid crystal-based optofluidic biosensor: supplement

HAONAN WANG,¹ TIANHUA XU,^{1,2,*}  ZIYIHUI WANG,^{1,3} YIZE LIU,¹ HUAIXU CHEN,¹ JUNFENG JIANG,^{1,4}  AND TIEGEN LIU¹

¹*School of Precision Instrument and Opto-Electronics Engineering, Tianjin University, Tianjin, 300072, China*

²*School of Engineering, University of Warwick, Coventry, CV4 7AL, United Kingdom*

³*School of Electrical and Electronics Engineering, Nanyang Technological University, Singapore 639798, Singapore*

⁴*jiangjffxu@tju.edu.cn*

**tianhua.xu@ieee.org*

This supplement published with Optica Publishing Group on 27 June 2023 by The Authors under the terms of the [Creative Commons Attribution 4.0 License](https://creativecommons.org/licenses/by/4.0/) in the format provided by the authors and unedited. Further distribution of this work must maintain attribution to the author(s) and the published article's title, journal citation, and DOI.

Supplement DOI: <https://doi.org/10.6084/m9.figshare.23544558>

Parent Article DOI: <https://doi.org/10.1364/BOE.494783>

Supporting Information *for*

Highly sensitive and label-free detection of biotin using liquid crystal-based optofluidic biosensor

Haonan Wang¹, Tianhua Xu^{1, 2*}, Ziyihui Wang^{1,3}, Yize Liu¹, Huaixu Chen¹, Junfeng Jiang^{1*} and Tiegen Liu¹

1. School of Precision Instrument and Opto-Electronics Engineering

Tianjin University

Tianjin, 300072, China

E-mail: tianhua.xu@ieee.org, jiangfjxu@tju.edu.cn

2. School of Engineering

University of Warwick

Coventry, CV4 7AL, United Kingdom

E-mail: tianhua.xu@ieee.org

3. School of Electrical and Electronics Engineering

Nanyang Technological University

Singapore 639798, Singapore

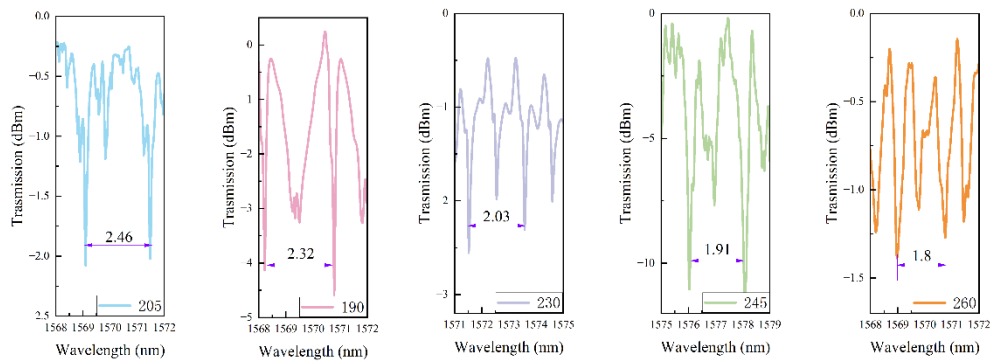


Figure S1 WGM spectrum from LC-based optofluidic WGM micro-resonator. For the micro-resonator with a diameter of 190 μ m, the FSR can be estimated to be 2.46nm.

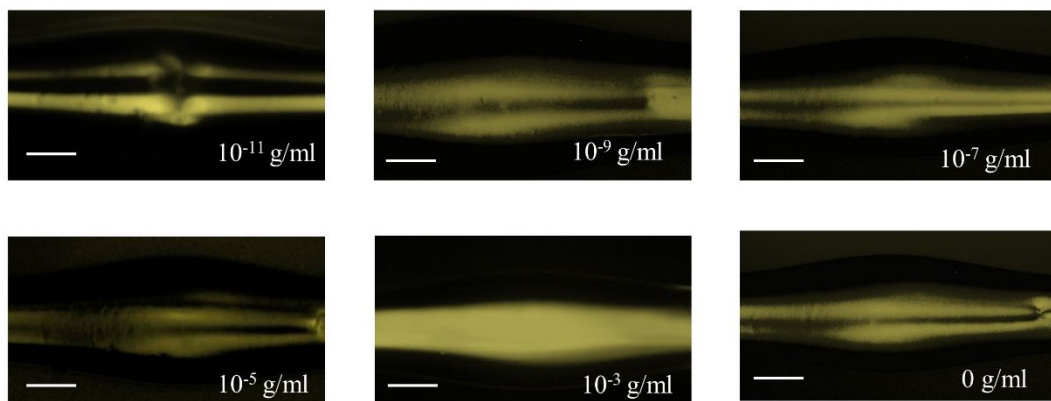


Figure S2 Monitoring polarized light micrograph of an LC-based WGM microcavity filled with different concentrations of biotin (from 10^{-11} g/ml to 10^{-3} g/ml), and polarization images in the absence of biotin are provided as a control. Scale bar: 100 μ m.

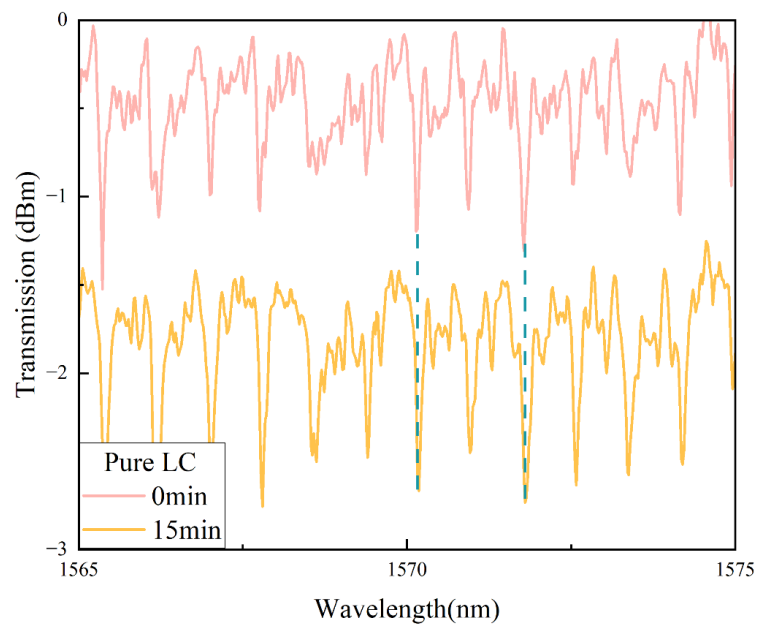


Figure S3 Spectral response signal of LC-based optofluidic biosensor in the absence of biotin and SA (recorded at 15 min).

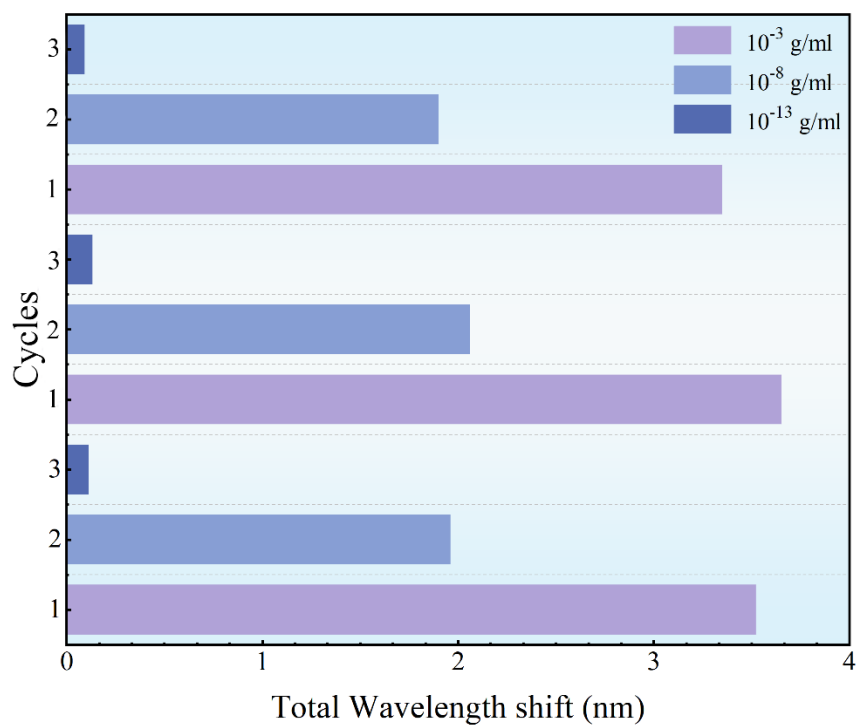


Figure S4 Spectral responses of LC-based optofluidic biosensor in three-cycle experiments at three different concentrations of biotin (10^{-3} g/mL, 10^{-8} g/mL, 10^{-13} g/mL).

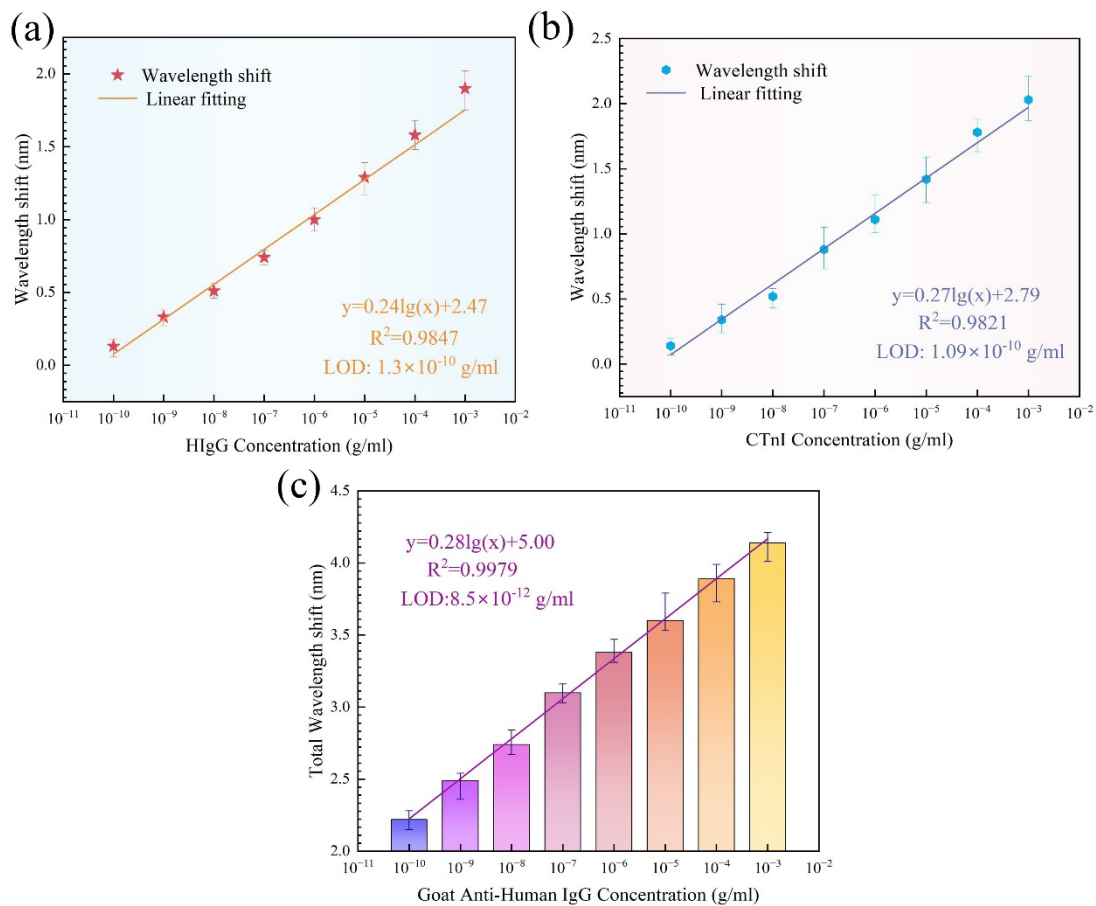


Figure S5 (a) Total spectral shift of WGM for HIgG at concentrations from 10^{-3} g/ml to 10^{-10} g/ml. (b) WGM spectral shift for various concentrations of CTnI. (c) WGM total spectral shift caused by specific binding between a fixed concentration of HIgG (10^{-3} g/ml) and different concentrations of goat AHlgG.

Table S1 Comparison of the detection limits of biotin with different sensing methods.

Method	Detection Limit	Ref.
TR-FRET	0.03 nM	[1]
Competitive immunoassay	2 pM	[2]
Fluorescence	6 nM	[3]
Flow-injection chemiluminescence	0.03 nM	[4]
LC-based WGM sensing platform	0.4 fM	This work

Reference

- [1] H. Chen, Y. Feng, Y. Cao, Y. Tang, T. Liu, A study on the detection of free and bound biotin based on TR-FRET technology, *Analyst.* 147 (2022) 318–324. <https://doi.org/10.1039/D1AN01664D>.
- [2] W.-Z. Lin, Y.-H. Chen, C.-K. Liang, C.-C. Liu, S.-Y. Hou, A competitive immunoassay for biotin detection using magnetic beads and gold nanoparticle probes, *Food Chem.* 271 (2019) 440–444. <https://doi.org/10.1016/j.foodchem.2018.07.152>.
- [3] X. Xiong, Y. Tang, J. Zhao, S. Zhao, Oligonucleotide-stabilized fluorescent silver nanoclusters for the specific and sensitive detection of biotin, *Analyst.* 141 (2016) 1499–1505. <https://doi.org/10.1039/C5AN02307F>.
- [4] H. Härmä, T. Soukka, A. Shavel, N. Gaponik, H. Weller, Luminescent energy transfer between cadmium telluride nanoparticle and lanthanide(III) chelate in competitive bioaffinity assays of biotin and estradiol, *Anal Chim Acta.* 604 (2007) 177–183. <https://doi.org/10.1016/j.aca.2007.10.003>.